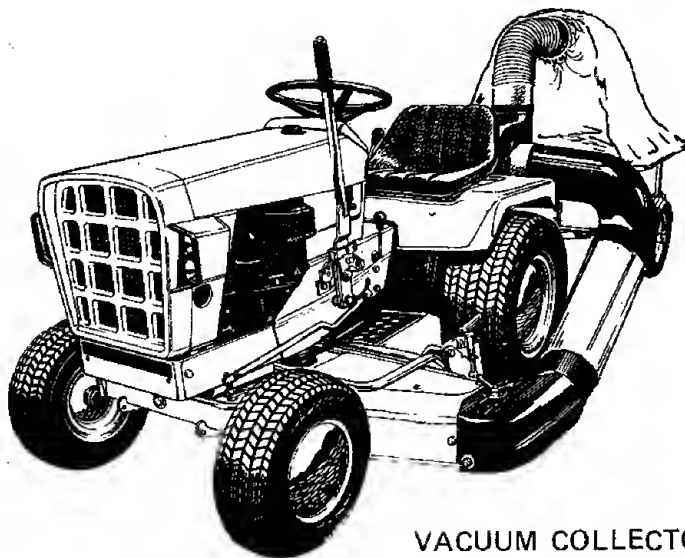


VACUUM COLLECTOR DUMP CART COVER ROVING NOZZLE DUMP CART

OPERATOR'S MANUAL



VACUUM COLLECTOR (PTO) MFG. NO. 1690024
DUMP CART COVER MFG. NO. 1600395
ROVING NOZZLE MFG. NO. 1690031
DUMP CART, 1000 LB. MFG. NO. 1600236
VACUUM COLLECTOR ADAPTER MFG. NO. 1690026
VACUUM COLLECTOR ADAPTER MFG. NO. 1690027

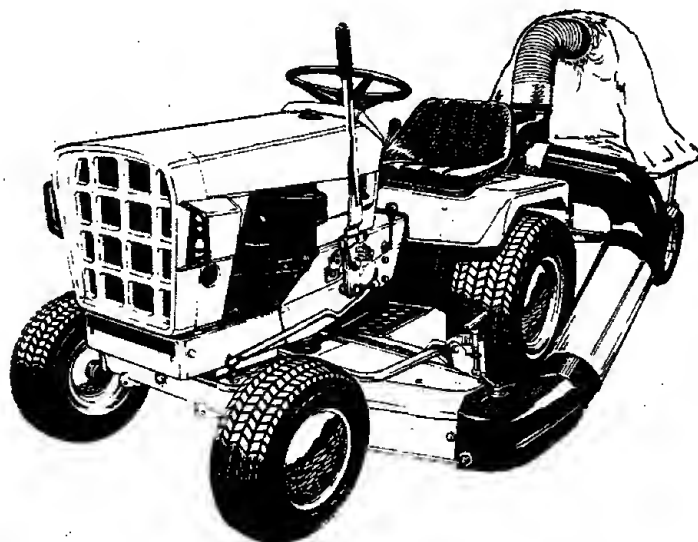


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Safety Rules



This notation preceding Cautions and Warnings in the text signifies important precautionary steps which, if not properly followed, could result in personal injury or damage to your equipment.

General

- Read the Operating and Service Instructions carefully. Be thoroughly familiar with the controls and the proper use of the equipment.
- Never allow children to operate the machine. Do not allow adults to operate it without proper instruction.
- Do not carry passengers.
- Keep the area of operation clear of all persons, particularly small children and pets.
- When using any attachments, never direct discharge of material toward bystanders nor allow anyone near the vehicle while in operation.
- Make sure
 - a. tractor and attachments are in good operating condition,
 - b. all safety devices and shields are in place and in good working condition, and
 - c. all adjustments, (cutting height, etc.), have been made.

Preparation

- Handle gasoline with care — it is highly flammable.
 - a. Use approved gasoline container.
 - b. Never remove the cap of the fuel tank or add gasoline to a running or hot engine, or fill the fuel tank indoors. Wipe up spilled gasoline.
- Do not run the engine indoors. Exhaust fumes are dangerous.
- Clear the work area of objects which might be picked up and thrown.
- Disengage all attachment clutches and shift into neutral before attempting to start the engine.
- Wear heavy footwear. Do not operate tractor when barefoot or when wearing open sandals or canvas shoes.

Operation

- Disengage power to attachments and stop engine before unclogging attachment chutes.
- Disengage power to attachment(s) and stop the engine before leaving the operator's position.
- Disengage power to attachment(s) and stop the engine before making any repairs or adjustments.
- When using the vehicle with mower, proceed as follows:
 - a. Mow only in daylight or in good artificial light.
 - b. Never make a cutting height adjustment while the engine is running.
 - c. Check the blade mounting bolts for proper tightness at frequent intervals.
- Do not stop or start suddenly when going uphill or downhill. Mow up and down the face of steep slopes; never across the face.
- Reduce speed on slopes and in sharp turns to prevent tipping or loss of control. Use extreme caution when changing direction on slopes.
- Stay alert for holes in the terrain and other hidden hazards. Be extra careful when operating on wet or slippery surfaces.
- The vehicle and attachments should be stopped and inspected for damage after striking a foreign object, and the damage should be repaired before restarting and operating the equipment.
- Watch out for traffic when crossing or near roadways.
- If equipment begins to vibrate abnormally — disengage power to attachments and stop engine at once. Inspect for damage and correct before starting up tractor.
- Use care when pulling loads or using heavy equipment.
 - a. Use only drawbar hitch point.
 - b. Limit loads to those you can safely control.
 - c. Do not turn sharply. Use care when backing.
 - d. Use weights when suggested in the owner's manual.
- Disengage power to attachment(s) when transporting or not in use.
- Take all possible precautions when leaving the vehicle unattended, such as disengaging the power take-off, lowering the attachment(s), shifting into neutral, setting the parking brake, stopping the engine, and removing the key.
- Keep the vehicle and attachments in good operating condition, and keep safety devices in place.

Maintenance and Storage

- Keep all nuts, bolts, and screws tight to be sure the equipment is in safe working condition.
- Do not change the engine governor settings or overspeed the engine.
- To reduce fire hazard, keep the engine free of grass, leaves, or excessive grease.
- Never store the equipment with gasoline in the tank inside a building where fumes may reach an open flame or spark. Allow the engine to cool before storing in any enclosure.

Operation

CONTENT OF SECTION

This section provides operating procedures for the vacuum collector. Included are procedures for installing the vacuum collector on the tractor and removing the vacuum collector, as well as lawn cleaning hints.

The vacuum collector must be assembled before it can be used on the tractor. The necessary assembly procedures are provided in the Assembly Section of this manual.

INSTALLING VACUUM COLLECTOR

To install the vacuum collector on your tractor, proceed as follows:

1. Lift the vacuum collector blower assembly up and hook the upper hitch arms over the support shaft. Align the lower hitch arms with the holes in the lower drawbar, and attach the hitch arms to the tractor drawbar with two pins and spring clips provided. (See figure 1.)

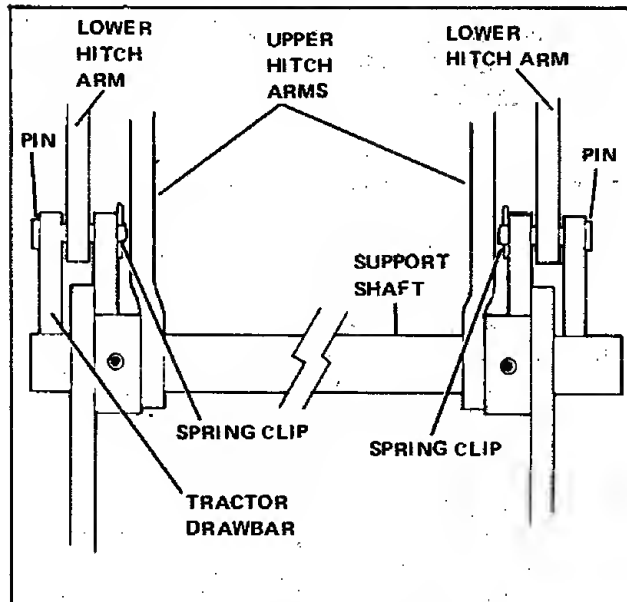


Figure 1. Attaching Blower Unit to Tractor

2. Install the vacuum collector drive belt in the left (outer) groove on the tractor PTO pulley. Place the other end of the belt on the vacuum collector drive pulley, with the idler pulley positioned underneath the lower portion of the belt, as shown in figure 2. Hook the idler spring over the left upper hitch arm.

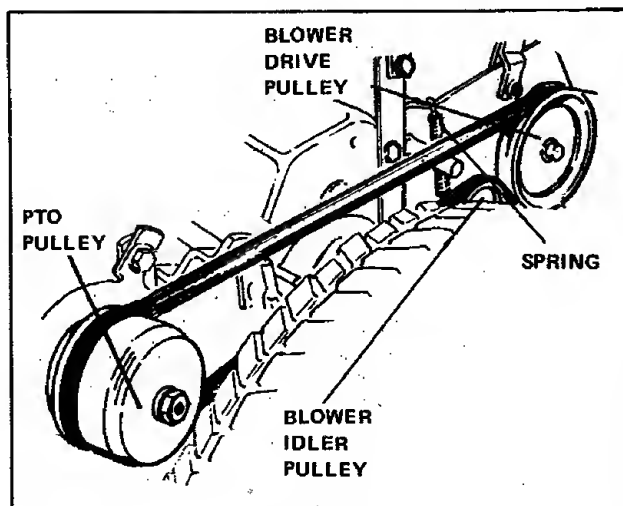


Figure 2. Drive Belt

3. Remove the deflector from the mower and install the correct vacuum collector adapter to the mower housing, and tighten the wing nut. (See the Assembly Section of this manual on how to prepare mower housing to install adapter.)
4. Slide the inlet tube over the vacuum collector adapter end, and slide the other end of the inlet tube into the short side of the inlet elbow. (See figure 3.)
5. Slide the inlet flange (on the long side of the inlet elbow) into the retaining clips on the blower housing. Slide the two clamp bars over the flange and tighten the clamp bars with the two wing nuts. (See figure 3.)

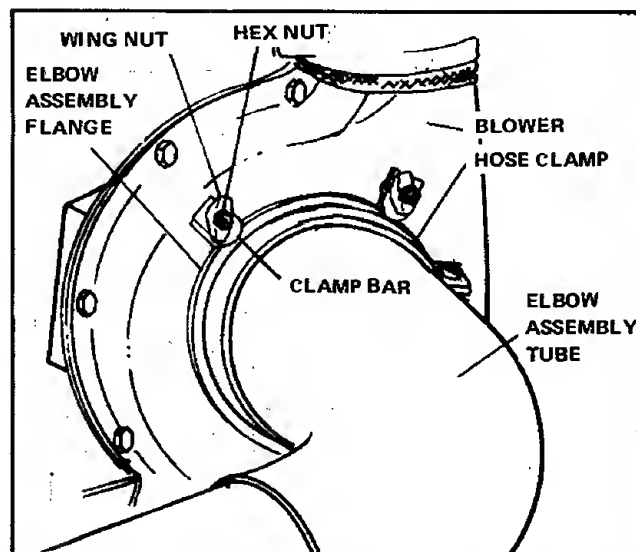


Figure 3. Installing Inlet Tubes

6. Place the discharge hose over the blower deflector and attach it to the blower housing with a hose clamp. Tighten screw. (See figure 4.)

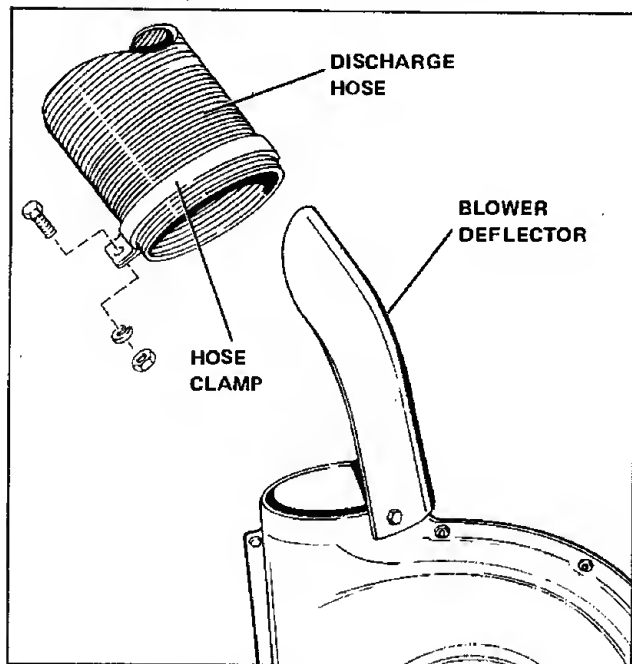


Figure 4. Discharge Hose Installation

7. Attach the dump cart, with the dump cart cover installed, to the drawbar on the vacuum collector assembly.
8. Insert the free end of the discharge hose through the opening in the dump cart cover so that it extends at least 12 inches into the cover. Tighten the cover opening around the discharge hose with the belt in the cover opening. (See figure 5.)

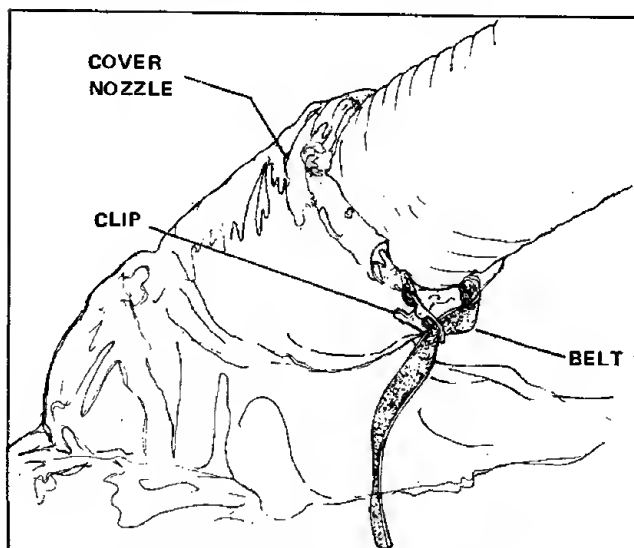


Figure 5. Installing Hose in Cover

CHECKS BEFORE STARTING

The checks listed below should be performed before each use of the vacuum collector.

1. Be sure you are familiar with the safety precautions, controls, and operation of the tractor. Read the tractor operating manual very carefully.
2. Check the mower and vacuum collector to be sure they are properly installed and to be sure that all nuts, bolts, and pins are securely fastened.

NOTE

Never operate the mower unless the discharge guard and either the deflector assembly or the vacuum collector adapter are fastened securely in place.

3. Refer to the Normal Care Section of this manual to determine and perform any needed care of the vacuum collector.
4. Clear the lawn of all sticks, stones, wire, and other debris which may be caught or thrown by the mower blades and vacuum blower.

OPERATING THE VACUUM COLLECTOR

⚠ WARNING

Do not work around the mower housing or blower area until you are certain that the mower blades and the blower fan have stopped rotating.

Always stop the tractor engine and disengage the PTO before removing any of the hoses or attempting to clean out any part of the vacuum collector.

When using the roving nozzle, always make sure that the mower blades are not rotating before leaving the operator's position on the tractor.

Always put the tractor transmission in neutral and fully engage the parking brake before leaving the tractor seat to operate the roving nozzle. Be careful to stay away from all moving parts.

Operation

Before operating the vacuum collector, be sure you are thoroughly familiar with the operation of your tractor. Consult your tractor's operator's manual if you have any questions on its operations.

Under average dry conditions set the tractor engine throttle about $\frac{3}{4}$ open and operate mower in normal mowing speeds. Under damp conditions or when collecting thick heavy material run engine at full throttle and slow ground speed.

When collecting leaves and tall grass raise the mower to highest cutting height on first pass, then lower it for the second pass.

In extremely heavy or tall green grass it may be necessary to cut only half the width of the mower to prevent the hoses from clogging up. Check the hoses and blower housing periodically to make sure the material does not accumulate and block the flow to cart.

NOTE

It is recommended that you do not try to collect grass or leaves that are wet with external moisture such as rain or dew.

Best results for filling the covered cart can be obtained with at least a $\frac{3}{4}$ or more engine speed throttle setting.

As the cart and cover fill up it is advisable to occasionally stop the forward motion of the tractor and stop the mower and vacuum collector fan to allow the cart cover to settle and show how full the cart is. If the cart is over-filled the discharge tube can be quickly filled and the blower plugged.

Dumping Cart

To empty the cart, back it into the area where material is to be dumped, disengage the drive to the mower and to the fan. Shift tractor transmission into neutral, apply the parking brake and stop the tractor engine.

Release the levers and unhook the latches from the front and rear of cart, (figure 6.) Lift the side and end bar reinforcement frame of the cover straight up off of the top of cart side frames until the pin bolts clear the holes in side frames. Then lift rear of frame and cover up over the end of the discharge hose in effect turning the cover partly inside out. Support the front end bar on the cart tongue and lean the rest of the frame forward over the fan.

Turn the rear latches to clear the top of end gate and remove end gate. Trip front latch holding cart box to tongue and tip box back to dump material.

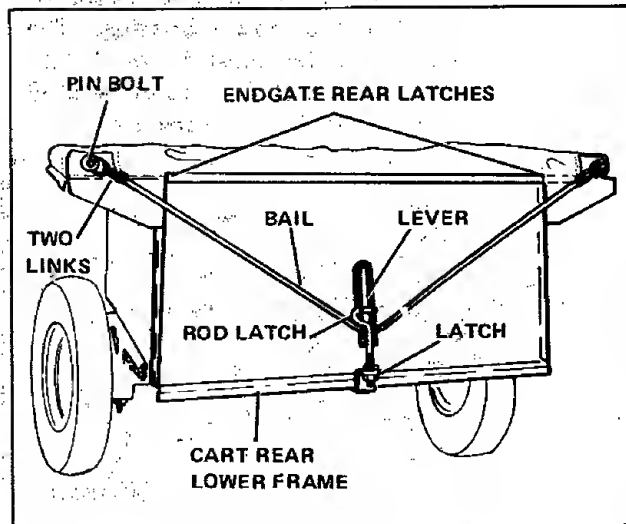


Figure 6. Dumping Cart

Roving Nozzle

The roving nozzle can be used to collect piles of leaves or grass in areas where the mower cannot reach, such as around flower beds, bushes and trees. See the Assembly Section of this manual on how to attach the roving nozzle to the vacuum collector.

REMOVING THE VACUUM COLLECTOR

When desired, remove the vacuum collector as follows:

1. Remove inlet elbow and inlet tube from blower assembly and adapter.
2. Remove vacuum collector drive belt from tractor PTO.
3. Remove pins from drawbar and lift blower assembly from tractor. Replace pins and spring clips in vacuum collector hitch for storage.
4. Remove adapter from mower housing by removing wing nut from the top carriage bolt.
5. Replace deflector on mower housing, holding it in place with the wing nut used to hold the adapter, and the hardware in the rear hole removed from the mower housing when the deflector was removed. (See figure 7.)

⚠ WARNING

Do not operate mower without deflector or adapter attached to the mower housing. The vacuum collector adapter must be used with the vacuum collector, and should not be used by itself in place of the mower deflector.

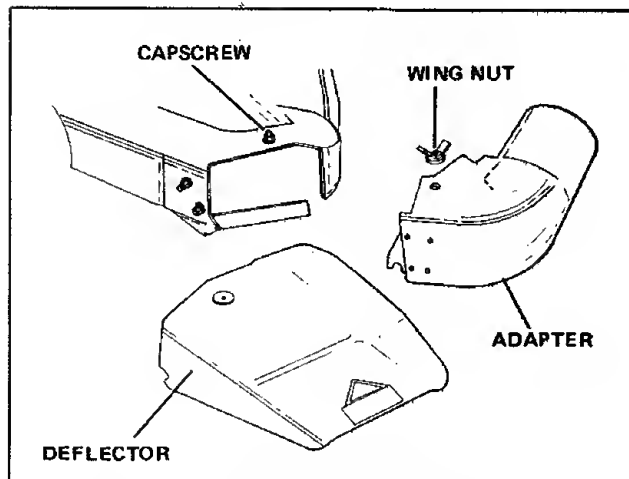


Figure 7. Replacing Mower Deflector

Normal Care

CONTENT OF SECTION

Your vacuum collector was designed and built to provide years of service with only minor care. Certain tasks, however, must be performed to keep in good operating condition and to avoid costly repairs. This section describes and provides procedures for the necessary care of the vacuum collector.

SCHEDULED CARE

A schedule for routine care of the vacuum collector is provided in figure 8. Some of the schedule requirements are based on operating hours. For this reason, it will be necessary to determine or estimate total operating time. This is easily accomplished if your tractor is equipped with an hour-meter. If not, you can determine normal times for regular jobs. Multiply these normal times by the number of times you perform these jobs and add any unusual operating time to estimate the total operating time.

STORAGE

To protect your vacuum collector, store it in an enclosed dry area. To prepare it for off-season storage, perform the following:

1. Remove unit from tractor. (Refer to procedure in Operation Section.
2. Clean vacuum collector to remove all grass and dirt.
3. Coat all bare metal surfaces with paint or a light coat of oil to prevent rusting.
4. Lubricate the vacuum collector cross shaft. (See figure 10.)

Care Required	See Figure	Before Each Use	After Each Use	Every 10 Hours	Yearly
Check to be sure all screws, nuts, bolts, and pins are present and secure.	None	•			
Clean vacuum collector, hoses, cart and cover of all grass and dirt.	9		•		
Lubricate blower cross shaft	10			•	
Lubricate dump cart	10				•*
* More often under heavy use.					

Figure 8. Summary of Scheduled Care

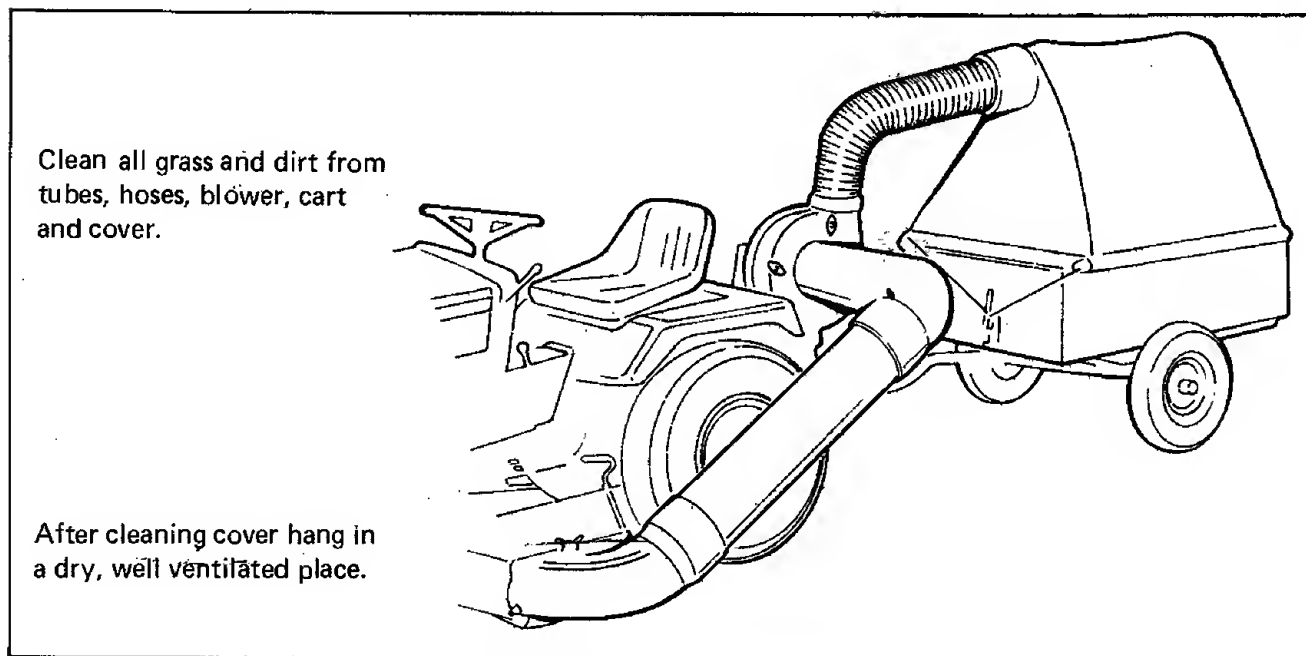


Figure 9. Clean Vacuum Collector, Cart and Cover

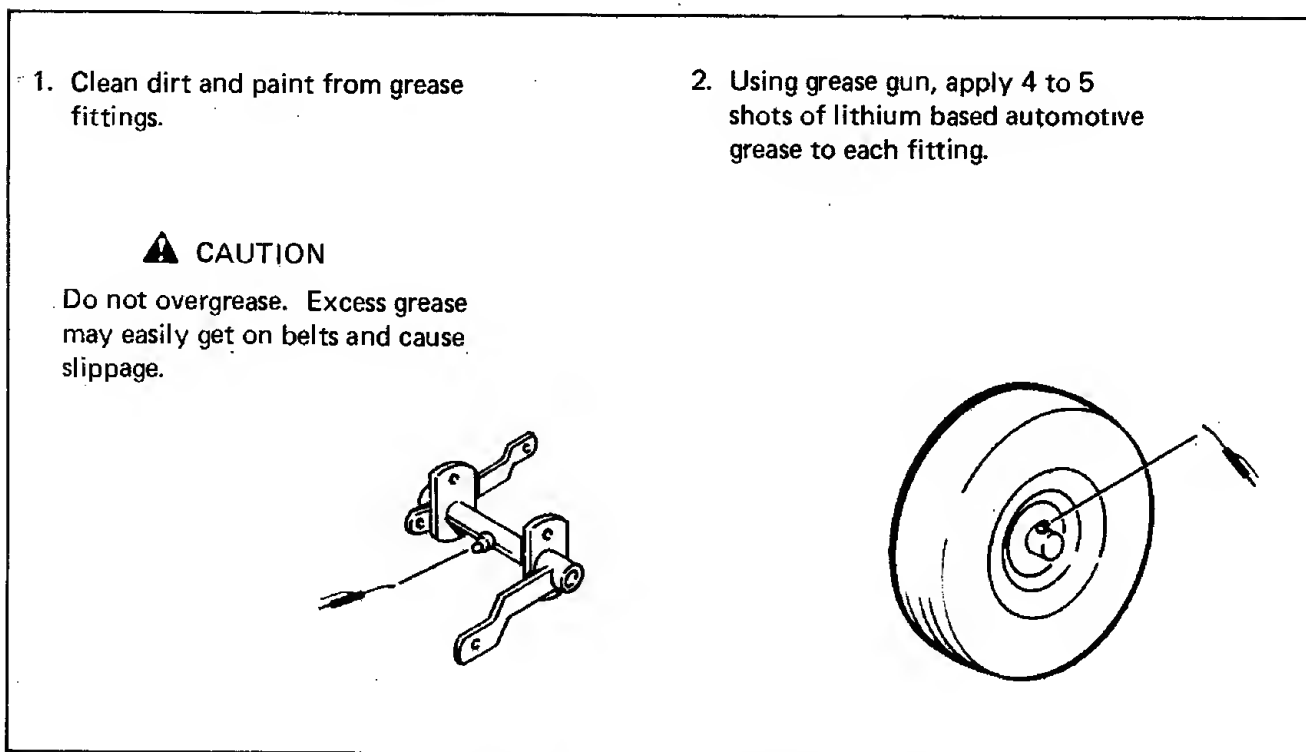


Figure 10. Lubrication of Cross Shaft and Dump Cart

Troubleshooting

CONTENT OF SECTION

This section provides troubleshooting and repair instructions for the more common and easily corrected problems.

WARNING

To avoid serious injury, perform maintenance on the vacuum collector only after stopping the tractor engine and waiting for all moving parts to come to a complete stop. Always remove the ignition key before beginning the maintenance to prevent accidental starting of the engine.

TROUBLESHOOTING PROCEDURES

Troubleshooting procedures are provided in figure 11. To use these procedures, first locate the problem description that best describes the trouble that you have encountered. Check the possible causes one at a time in the order that they are listed. Correct any problems that are found and operate the vacuum collector again to verify that you have eliminated the trouble.

Problem	Cause
1. Leaves and grass not being completely picked up.	A. Engine speed too slow. Run at 3/4 to full throttle B. Ground speed too fast. Use lower gear. C. Hose connections loose. Check and tighten any loose connections. D. Belts worn or dirty. Check and clean or replace as needed.
2. Hoses plug easily.	A. Grass or leaves too wet. Wait for drier conditions. B. Grass too high. Reduce tractor ground speed, reduce cutting width, or raise mower adjustment for the first pass, lower it for the second pass.
3. Vacuum collector blower vibrates abnormally.	A. Dirt built up on blower fan blades. Clean and try again. B. Fan or shaft bent or broken. Repair as necessary. C. Shaft bearings worn. Repair as necessary.

Figure 11. Troubleshooting

Assembly

CONTENT OF SECTION

The vacuum collector may be received partially assembled. Procedures necessary to complete the assembly of the vacuum collector are provided in this section.

ASSEMBLY OF THE VACUUM COLLECTOR

1. For tractors without a rear lift kit installed on the tractor, a support shaft and two collars are provided for installing the vacuum collector on the tractor. (On tractors with a rear lift kit installed, proceed to step 2.) On tractors without a rear lift kit, place the two set collars provided on the support shaft, the larger collar with a lip going on the left side with the lip facing outward. Position the support shaft in the rear hitch frame plates on the tractor so that the lip of the larger collar fits inside the left rear hitch frame plate and the end of the shaft is flush with the outside edge of the right hitch frame plate. Tighten the set collars so that there is no play from side to side in the support shaft. (See figure 12.)

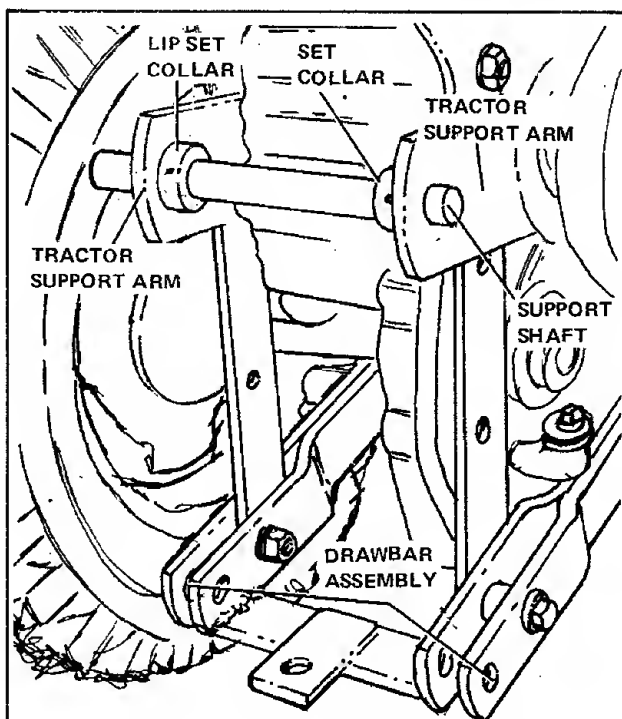


Figure 12. Installing Support Shaft

2. Remove the deflector from the mower, keeping the carriage bolts in place in the mower housing. Place the spacer provided with the

vacuum collector adapter on the front carriage bolt, then replace the flat washer, lockwasher and nut that were on the bolt. Tighten the nut on the bolt. (See figure 13.)

3. Replace the lockwasher and nut on the top carriage bolt, and tighten the nut to the mower housing. The vacuum collector adapter will fit over this bolt, with the wing nut holding it down on this bolt.

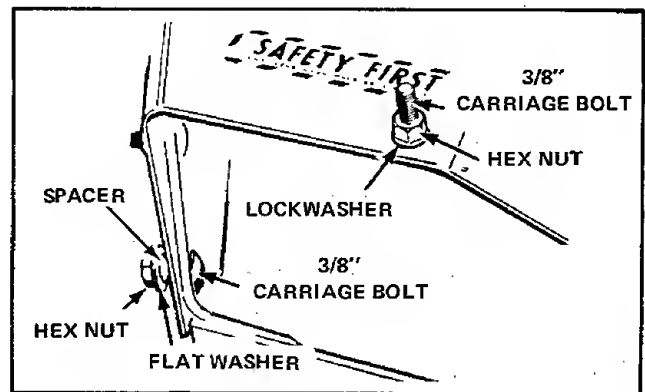


Figure 13. Preparing Mower Deck

4. Place the correct vacuum collector adapter on the mower housing as shown in figure 14. The front slot fits over the spacer just installed, and the top hole fits over the carriage bolt on the top of the mower housing. Place the wing nut on the top carriage bolt and tighten it.

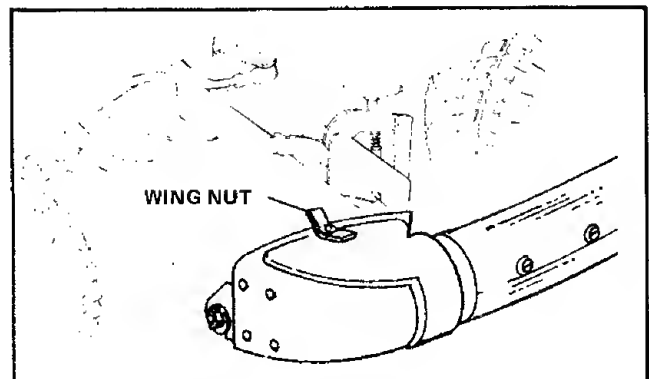


Figure 14. Installing Adapter

5. Assemble the inlet tube with the phillips head screws, flat washers, lockwashers and nuts provided. Place a flat washer on each screw, and insert the screws from the inside of the tube, placing a flat washer, lockwasher, and nut on each screw on the outside of the tube. (See figure 15.)

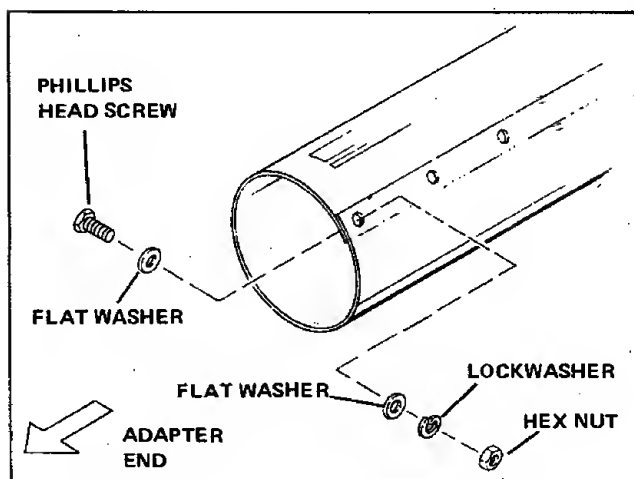


Figure 15. Assembling Inlet Tube

6. Insert the inlet flange into the long end of the inlet elbow, and hold the flange tight in the inlet elbow with a clamp and screw. (See figure 16.)
7. Attach the blower deflector to the outside of the blower housing with two self-tapping screws. (See figure 17.)

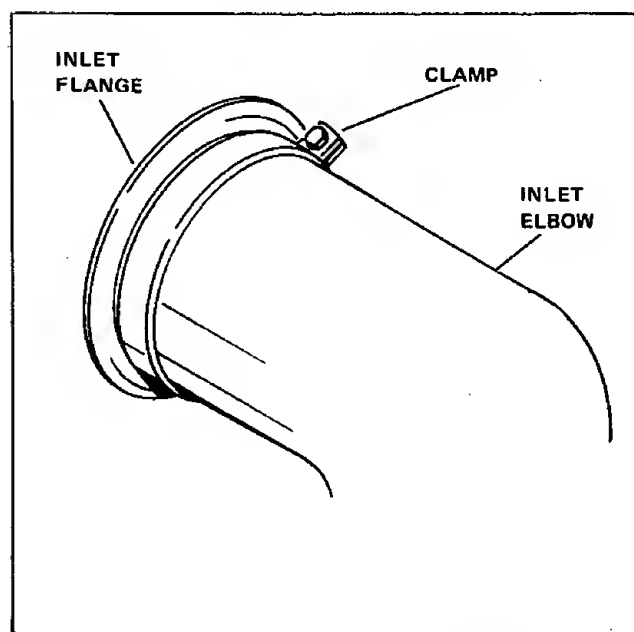


Figure 16. Assembling Inlet Elbow

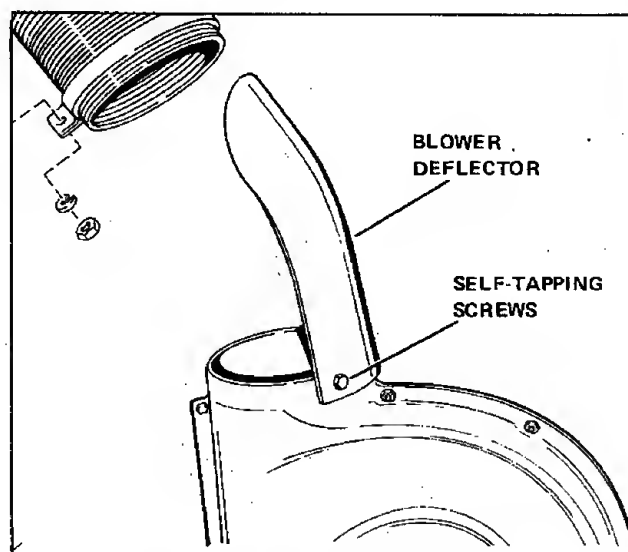


Figure 17. Assembling Deflector

ASSEMBLY OF DUMP CART

To assemble the dump cart, proceed as follows:

1. Clean the ends of the axle shaft with emery paper to remove any excess paint or burrs.
2. Slip wheels on ends of axle shaft. The wheels are held on by two 3/4 inch flat washers and 1-1/2 inch long cotter pins. Slip washers onto the axle shaft, then insert the cotter pins through the holes in the axle shaft, and spread the ends of the cotter pins.
3. With the bend in the center of the axle facing UP, place the cart frame over the axle so that the U-shaped pads on the axle fit inside the U-shaped brackets on the frame. Attach the axle to the frame with 5/16 x 1-3/4 inch capscrews and locknuts, one through each U-shaped bracket, see figure 18.
4. Attach the cart tongue to the cart frame with the tongue bend sloping downward, that is, the front of the tongue should be lower than the rear. Use two 3/8 x 2-1/4 inch capscrews, lockwashers and nuts (figure 18).
5. Attach the frame pivot assembly to the rear of the frame using two 1-1/2 inch pins and spring clips.

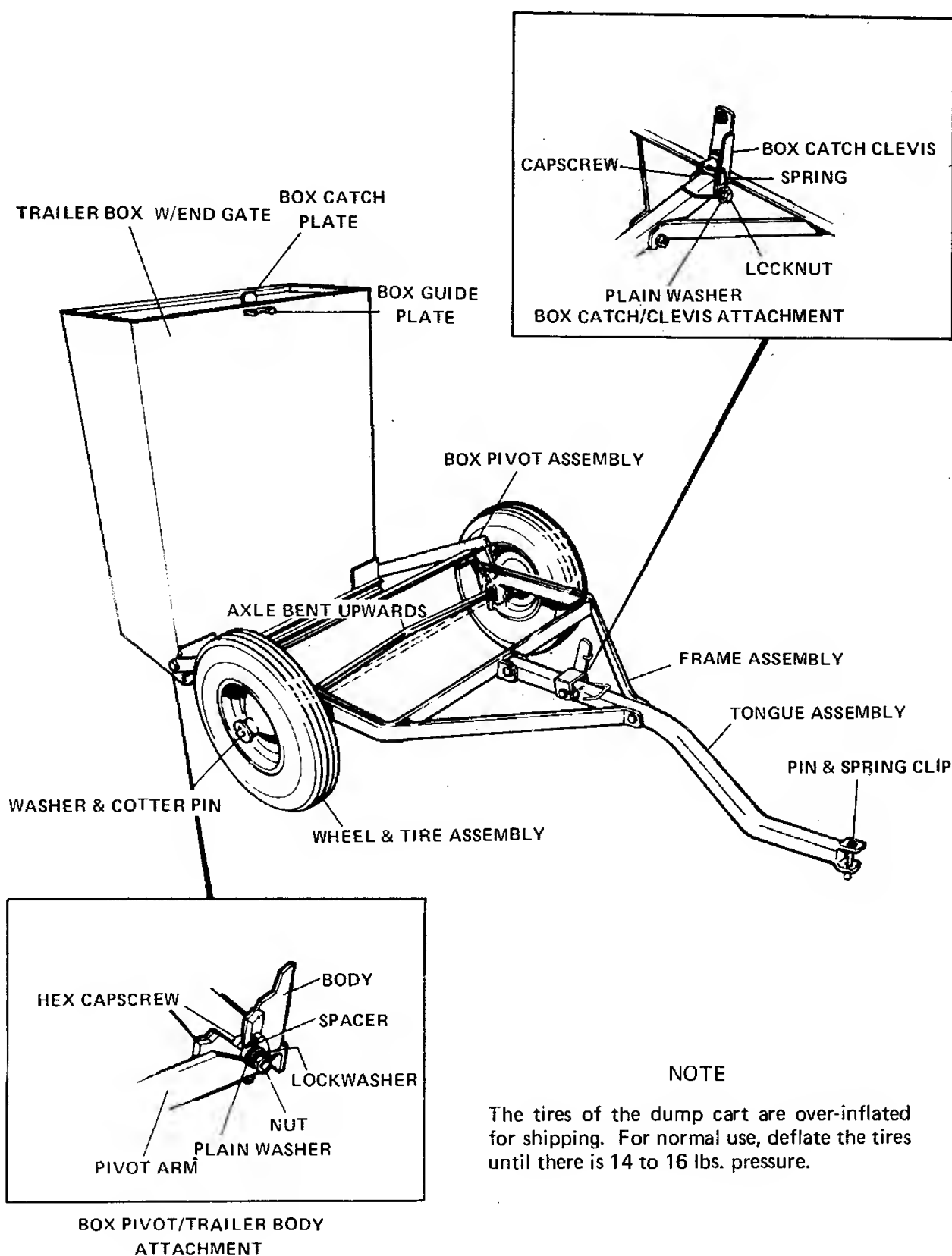


Figure 18. Dump Cart

6. Place the dump cart box on its endgate and attach the box to the frame pivot assembly using two $\frac{3}{8}$ x 1 inch capscrews, flat washers, bushing, lockwashers and nuts. Insert the capscrew from the inside of the box. Insert the bushing on the capscrew through the pivot assembly. Place flat washer and lockwasher on the capscrew, and tighten on the nut. (See figure 18.)
7. Attach the box latch clevis to the trailer tongue as shown in figure 18. Insert a $\frac{3}{8}$ x 2- $\frac{3}{4}$ inch capscrew through the clevis and tongue. Place the latch spring on the capscrew, and hook the large end over the tongue, the small end over the latch handle.
8. Place a $\frac{3}{8}$ inch flat washer on the capscrew and tighten on the $\frac{3}{8}$ inch locknut so that the latch is free to pivot on the tongue.
9. Place the box guide plate inside the trailer box with the grooved end extending through the slot in the box floor. Position the box catch plate on the outside of the box with the lip facing forward on the bottom. Attach both plates to the box with two $\frac{3}{8}$ x 1 inch capscrews, lockwashers and nuts, inserting the capscrews from the inside of the box.
10. A $\frac{3}{8}$ inch pin and spring clip are provided to attach the dump cart tongue to your power unit.

OPERATION

The dump cart is designed to carry 1,000 pounds. The axle is bent up slightly in the center to compensate for heavy loads. With its patented dump feature the box can be unlatched and turned completely upside down without unhooking the cart from the tractor. The tailgate is removable by pulling it straight up.

LUBRICATION

Each wheel of the dump cart has a standard size grease fitting on the hub. The wheels require occasional greasing (light to normal use, about once a year, normal to heavy use, more often.)

Wipe the grease fittings clean before greasing the wheels. Give each wheel about 4 to 5 shots of lithium based automotive grease. Apply a few drops of clean motor oil to the other moving parts of the cart, such as the latch pivot and the box pivot points.

ASSEMBLY OF DUMP CART COVER

To assemble the dump cart cover, proceed as follows:

1. Remove the tailgate from the cart.
2. Starting at the rear, slide a side panel onto the side of the cart so that the lip on the box side is inside the curl of the side panel. (See figure 19). Slide the side panel all the way to the front of the box. Put the other side panel on in the same manner.

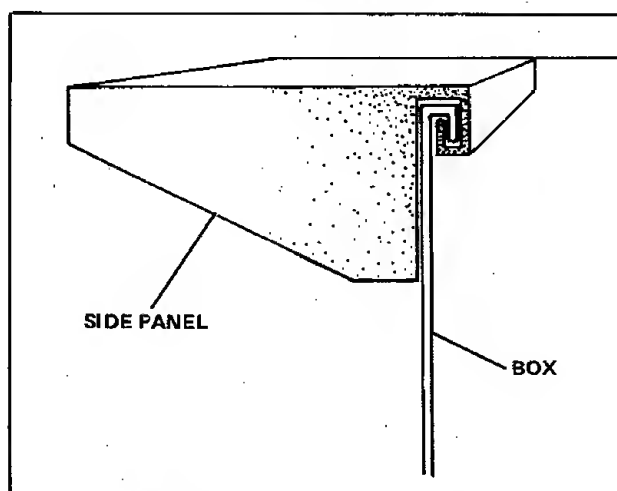


Figure 19. Installing Side Panels

3. Attach the front hooks to the side panels as shown in figure 20, using a $\frac{5}{16}$ x $\frac{3}{4}$ inch capscrew, flat washers, plastic washer, and locknut. Place a flat metal washer above the front hook on the capscrew and a plastic washer below the front hook. Insert the capscrew through the side panel, and place another $\frac{5}{16}$ flat washer and locknut on the capscrew. Position the front hook as shown in figure 11 and tighten the locknut.
4. Attach the rear latches to the side panels as shown in figure 21, using a $\frac{5}{16}$ x $\frac{3}{4}$ inch capscrew, flat washer, two plastic washers, and locknut. Place the latch on the capscrew, then two plastic washers. Insert the capscrew through the side panel, and place a flat washer and locknut on the capscrew, tightening the locknut.
5. Insert the side and end reinforcing bars in the cart cover with the side bar angles pointed inward.

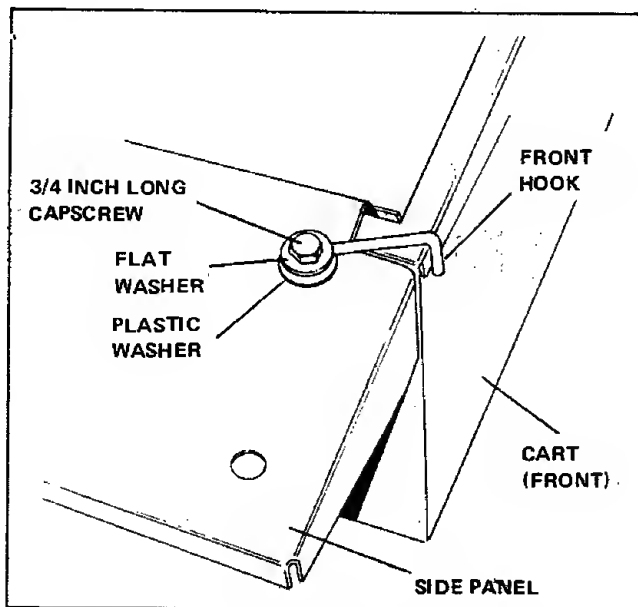


Figure 20. Installing Front Hooks

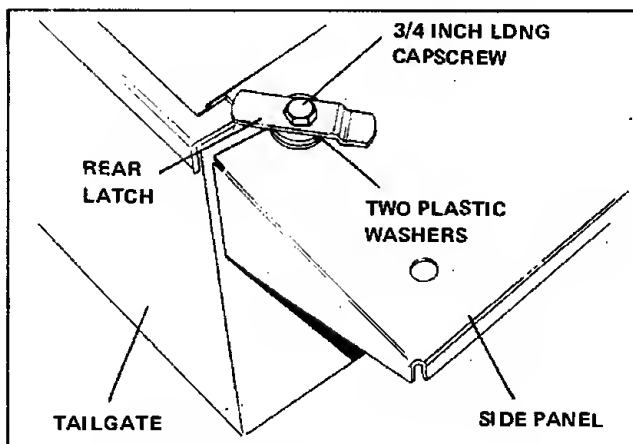


Figure 21. Installing Bar Latch

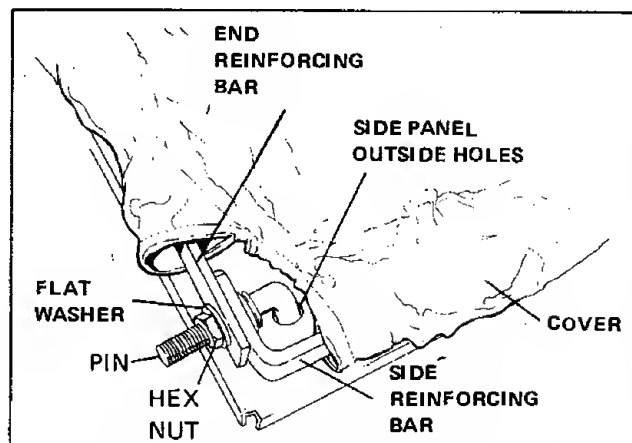


Figure 22. Assembling Cover Frame

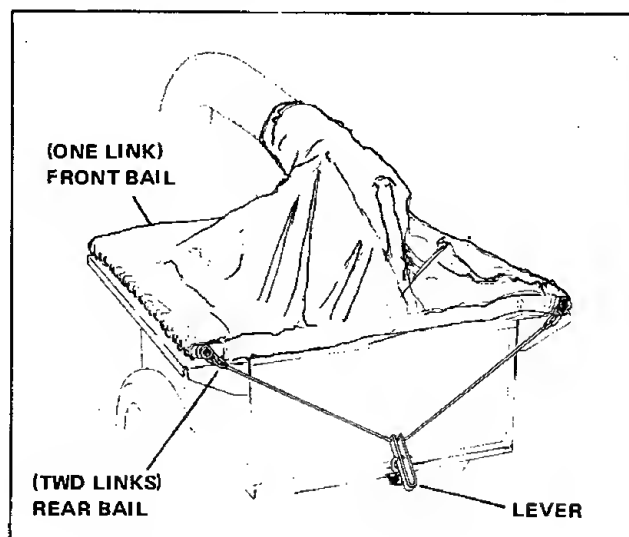


Figure 23. Assembling Cover Bails

9. Attach bracket to front of cart with 1-1/4 inch long capcrew (figure 24.)

6. See figure 22. Insert the threaded end of the cover pins through the reinforcing bars, place a 3/8 inch flat washer on the pin, and tighten on a 3/8 inch nut so that the pin is pointing downward to fit in the side panel holes. Repeat the procedure for the other three pins, so that the cover is installed with the cover inlet hole facing the front of the cart.
7. Insert each bail through slotted hole in lever and center the lever on the bail (figure 23).
8. Attach one link to each end of the front bail and two links to each end of the rear bail (figure 23.)

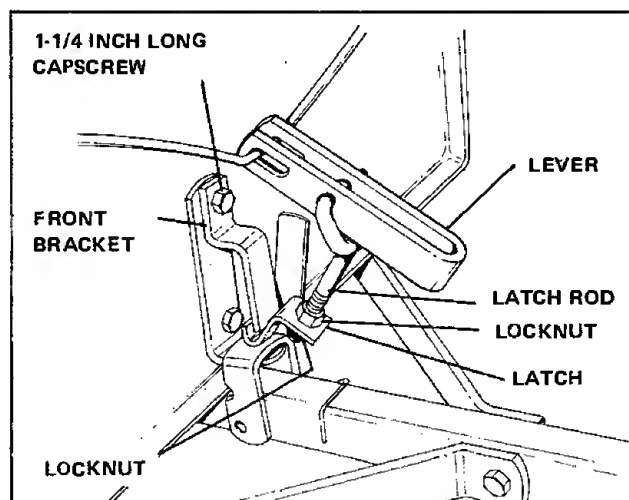


Figure 24. Assembling Front Latch

10. Attach the link of rear bail and link assembly (two links on each end of bail) to rear pins with a flat washer and locknuts. Repeat same procedure for front bail and link assembly (one link on each end of bail).
11. Insert rear latch rod through lever holes and secure it with a cotter pin (figure 15). Install locknut, latch, and locknut on latch rod. With lever in closed position, adjust latch until it is securely hooked under cart. Repeat procedure for front side with latch tight under bracket (figure 24).

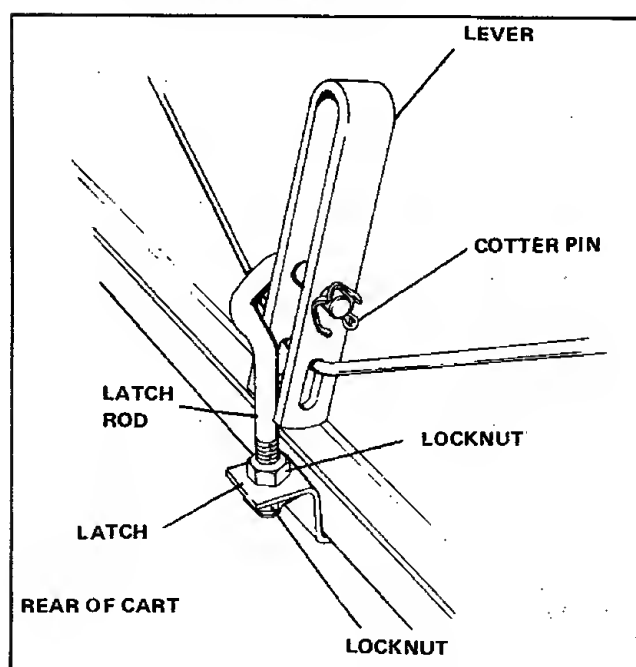


Figure 25. Assembling Rear Latch

ROVING VACUUM NOZZLE (Mfg. No. 1690031)

The nozzle attaches to the blower inlet in place of the hose from the mower.
Fig. 26

ASSEMBLY

1. Attach the mounting flange and clamp on the plain end of the hose. Tighten the clamp screw securely. (Figure 27).
2. Install the hose handle clamps the desired distance from the pickup end of the hose and attach the handle (Figure 28).
3. Attach the flanged end of the roving nozzle to the blower housing, seating the flange fully in the notches. (See figure 29).

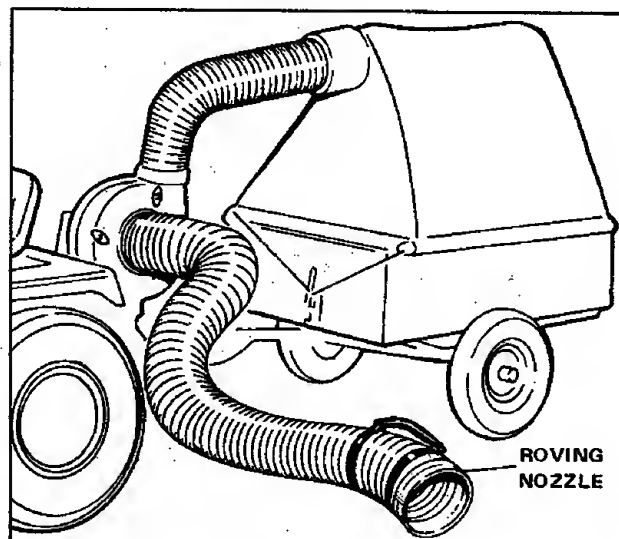


Figure 26. Roving Nozzle

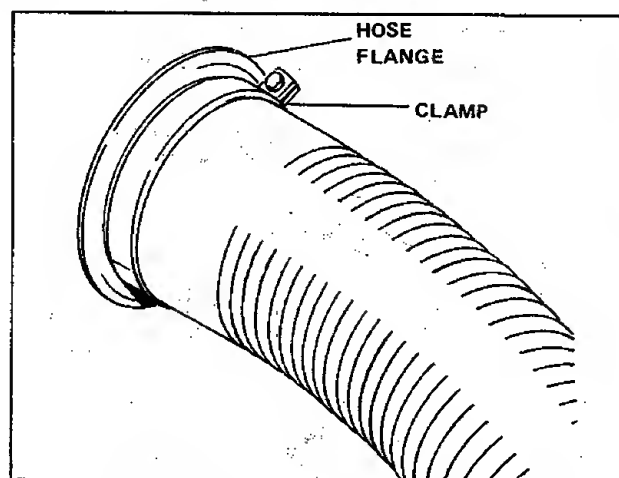


Figure 27. Installing Hose Flange

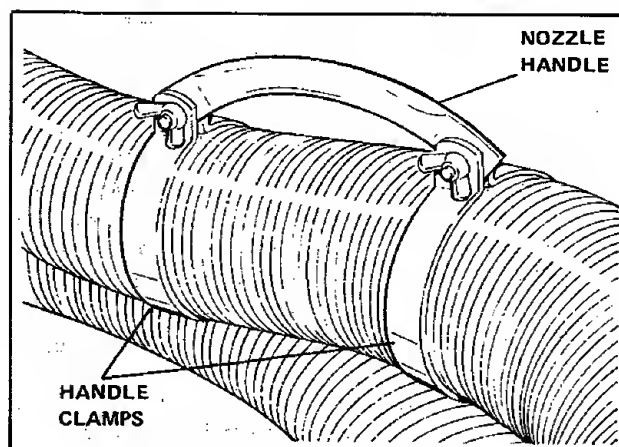


Figure 28. Installing Handle

⚠ WARNING

When using the roving nozzle, be sure that that the mower blades DO NOT rotate.

1. Before starting the tractor, disengage the mower belt tensioning lever on the left rear side of the tractor by pulling it all the way down. (See figure 29.)
2. Start tractor and engage power takeoff lever. From the operator's seat, check that the mower belt is not turning. If it is turning, disengage the PTO and stop the tractor engine, removing the key.
3. Remove the mower drive belt from the PTO pulley if it does turn with the belt tensioning lever in the released position.

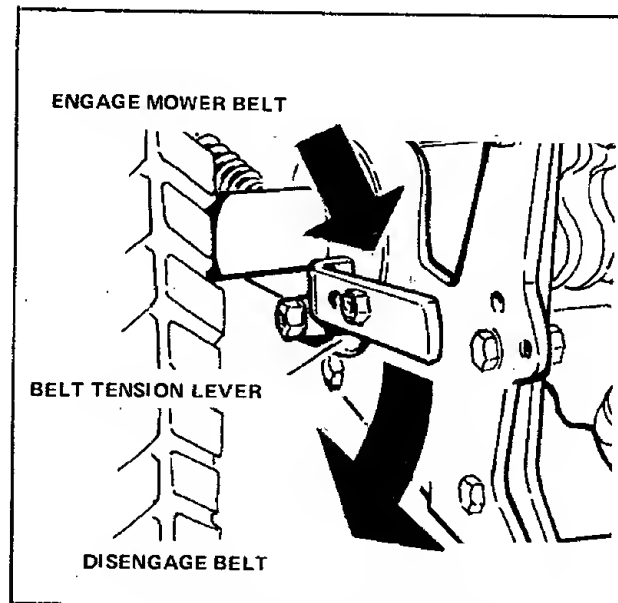


Figure 29. Disengaging Mower

SPECIFICATIONS

Hoses	Wire Reinforced Rubber Coated Fabric
Fan	Welded Steel Fan Assembly. Rotating on a Factory Lubricated and sealed high speed double row ball bearing.
Discharge	Accepts mower discharge from left hand side and discharges upward and rearward into dump cart cover.
Power Drive	From tractor PTO
Overall Dimensions	Width 10-3/4 Inches
	Length 21-3/4 Inches
	Height 27-1/8 Inches

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

[illegible]

Figure 1. The effect of the concentration of the *Agrobacterium* suspension on the transformation efficiency of *Agrobacterium* strains. The concentration of the *Agrobacterium* suspension was 10⁶ cells/ml (○), 10⁷ cells/ml (□), 10⁸ cells/ml (△), 10⁹ cells/ml (◇), and 10¹⁰ cells/ml (×). The error bars represent the standard deviation of three independent experiments.